

# **Alaskan Way Viaduct and Seawall Replacement Program**

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**23<sup>rd</sup> Annual Statewide Project Engineers Conference**  
**Chelan, WA**  
**March 25, 2009**



**Washington State  
Department of Transportation**

# Agenda

## Last year:

- History
- Viaduct and seawall vulnerabilities
- Moving Forward projects
- Central waterfront planning

## This year:

- Summary of 2008 – 2009 activities
- Update: Moving Forward projects
- Bored Tunnel Hybrid Alternative



Alaskan Way circa 1931

# 2008 - 2009 Milestones

## January – December 2008:

Stakeholder Advisory Committee members review, deliberate on and provide focused comments on technical work for central waterfront replacement

## September 2008:

Electrical Line Relocation Project begins

## November 2008:

SR 519 Intermodal Access Project Phase 2 begins

## January 2009:

Governor, County Executive and Mayor announce recommendation for replacing viaduct



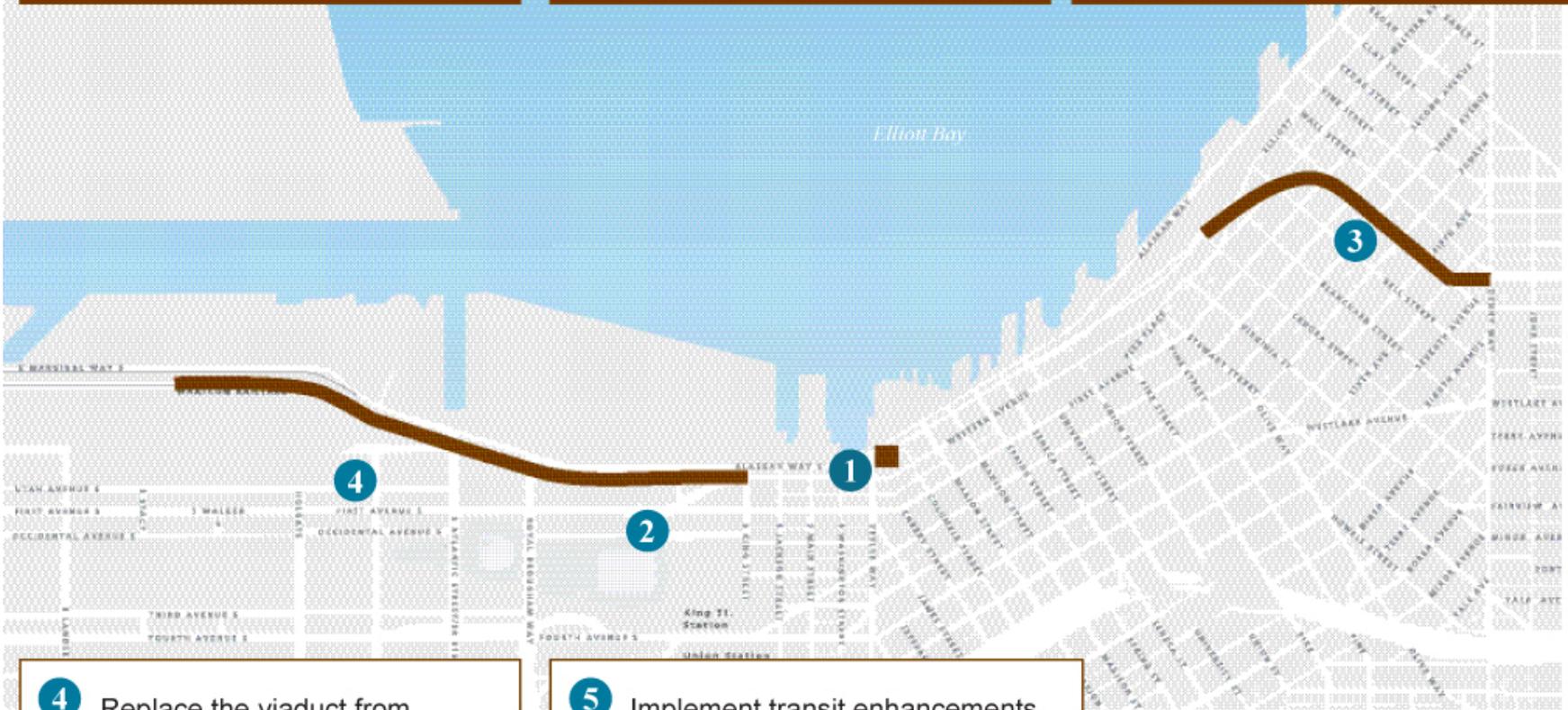
# Moving Forward Projects Update

# Moving Forward Projects

**1** Stabilize four column foundations between Columbia Street and Yesler Way

**2** Relocate electrical lines between South Massachusetts Street and Railroad Way S.

**3** Conduct regular maintenance and repair existing fire and life safety systems



**4** Replace the viaduct from S. Holgate to S. King streets

**5** Implement transit enhancements and other improvements

# Relocate Electrical Lines

- Relocate electrical lines to underground system east of the viaduct between Massachusetts Street and Railroad Way
- Completed work under Royal Brougham Way.
- Currently installing trench and conduit between Royal Brougham and Railroad Way.



Construction: September 2008 – 2009

Status: In construction

# Maintain Battery Street Tunnel

- Conduct regular maintenance on the tunnel and repair its fire and life safety systems
- WSDOT and the City of Seattle will work together to decide the future of the tunnel



Construction: TBD

Status: Conduct further inspection and systems testing during March closure

# South End Project Update

- Holgate to King project fits well with Bored Tunnel Hybrid Alternative
- Major design elements unchanged south of Royal Brougham
- Transition structures and detours now in design
- On schedule:
  - Utility relocation summer 2009
  - Road and bridge construction early 2010



# Transit Enhancements and Other Capital Improvements

**WSDOT, King County and the City of Seattle have agreed upon a list of projects to keep people and goods moving during SR 99 construction.**

## **These projects include:**

- I-5 variable speed limits
- SR 519 freight connections
- Spokane Viaduct improvements
- Increased bus service
- Real-time traveler information

Construction: 2008-2011

Status: In Construction



# Central Waterfront Update



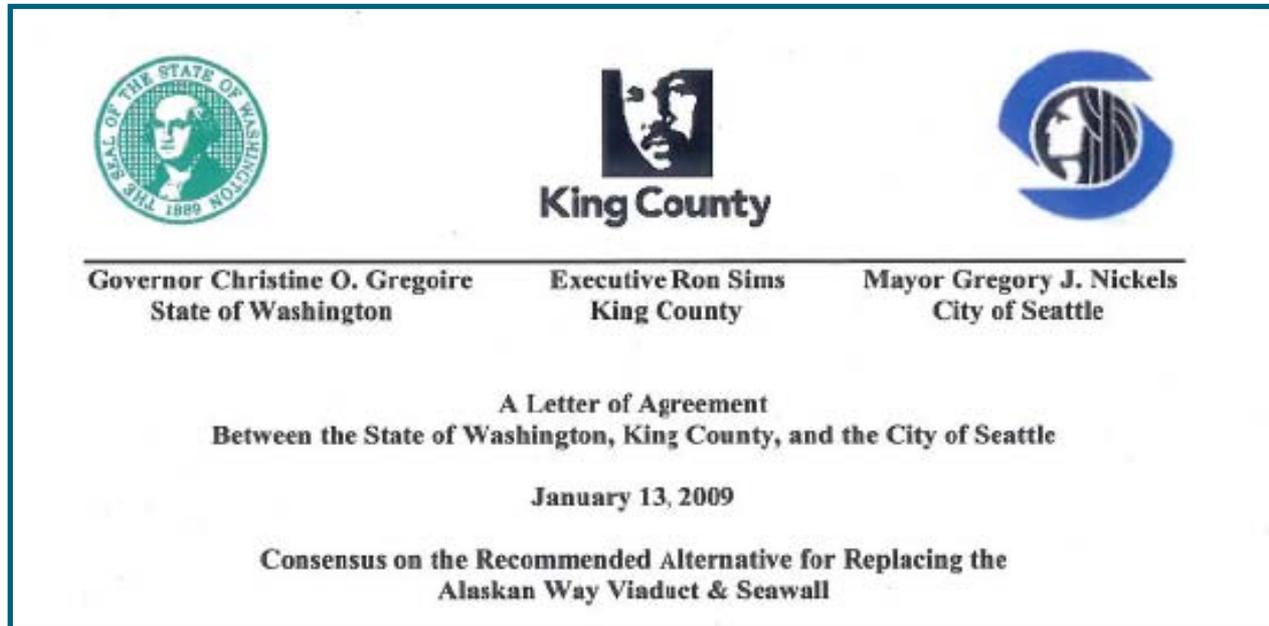
# Guiding Principles

**The three executives agreed that any solution for the Alaskan Way Viaduct needed to be grounded in a commitment and integration across six guiding principles:**

- Improve public safety.
- Provide efficient movement of people and goods now and in the future.
- Maintain or improve downtown Seattle, regional, the port and state economies.
- Enhance Seattle's waterfront, downtown and adjacent neighborhoods as a place for people.
- Create solutions that are fiscally responsible.
- Improve the health of the environment.

# Letter of Agreement

On Jan. 13, 2009, Governor Gregoire, King County Executive Sims and Mayor Nickels signed a letter of agreement signifying their support of the bored tunnel hybrid alternative.



# Systems Solution

Upon evaluation of the new project area and with a clear direction to consider the entire system of streets, the three executives recommended that investments be made in:

- Improved city streets
- Enhanced transit service
- New bored tunnel



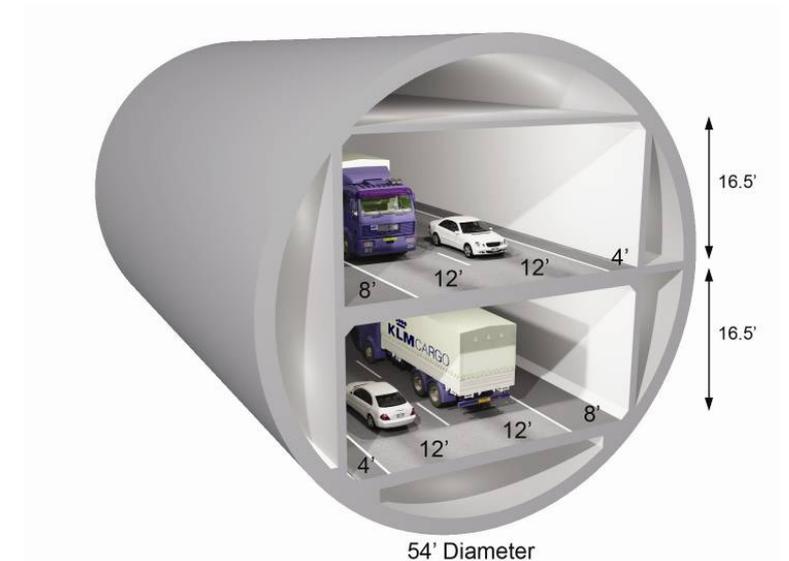
# Bored Tunnel Hybrid Alternative



# Bored Tunnel

A bored tunnel under First Avenue is the new SR 99. Some features include:

- Least traffic and business disruptions during construction.
- Two lanes of traffic, with shoulders, in each direction.
- Approximately two miles long.
- Between 30 and 200 feet underground.





# Maintains Capacity through Downtown

## The bored tunnel alternative:

- The tunnel will carry 85,000 vehicles through downtown Seattle each day at year of opening (with room to grow). Surface Alaskan Way will carry about 25,000 vehicles per day.
- Maintains today's travel times for trips through downtown.
- Accommodates in-city trips through new investments in local streets and transit.
  - New bus service will carry approximately 17,000 additional daily riders, primarily serving northwest and southwest Seattle.
- Improvements to I-5 further expand north-south vehicle capacity and provide improvements in travel times.



# Improves City Streets

**The improvement of City streets throughout Seattle will be important to the success of this solution. Projects underway include:**

## **Mercer Street Project:**

- Creates enhanced east-west connections.
- Improves connections from I-5 and the bored tunnel to Ballard/Magnolia/Interbay.
- Enhances connections between high density neighborhoods as well as the Seattle Center.

## **Spokane Street Project:**

- Provides critical connections between the Port, West Seattle, I-5, I-90 and SR 99.
- Improves westbound traffic flow and safety.
- Minimizes conflicts between freight, rail, commuters and ferry traffic.



# Enhances Transit Service

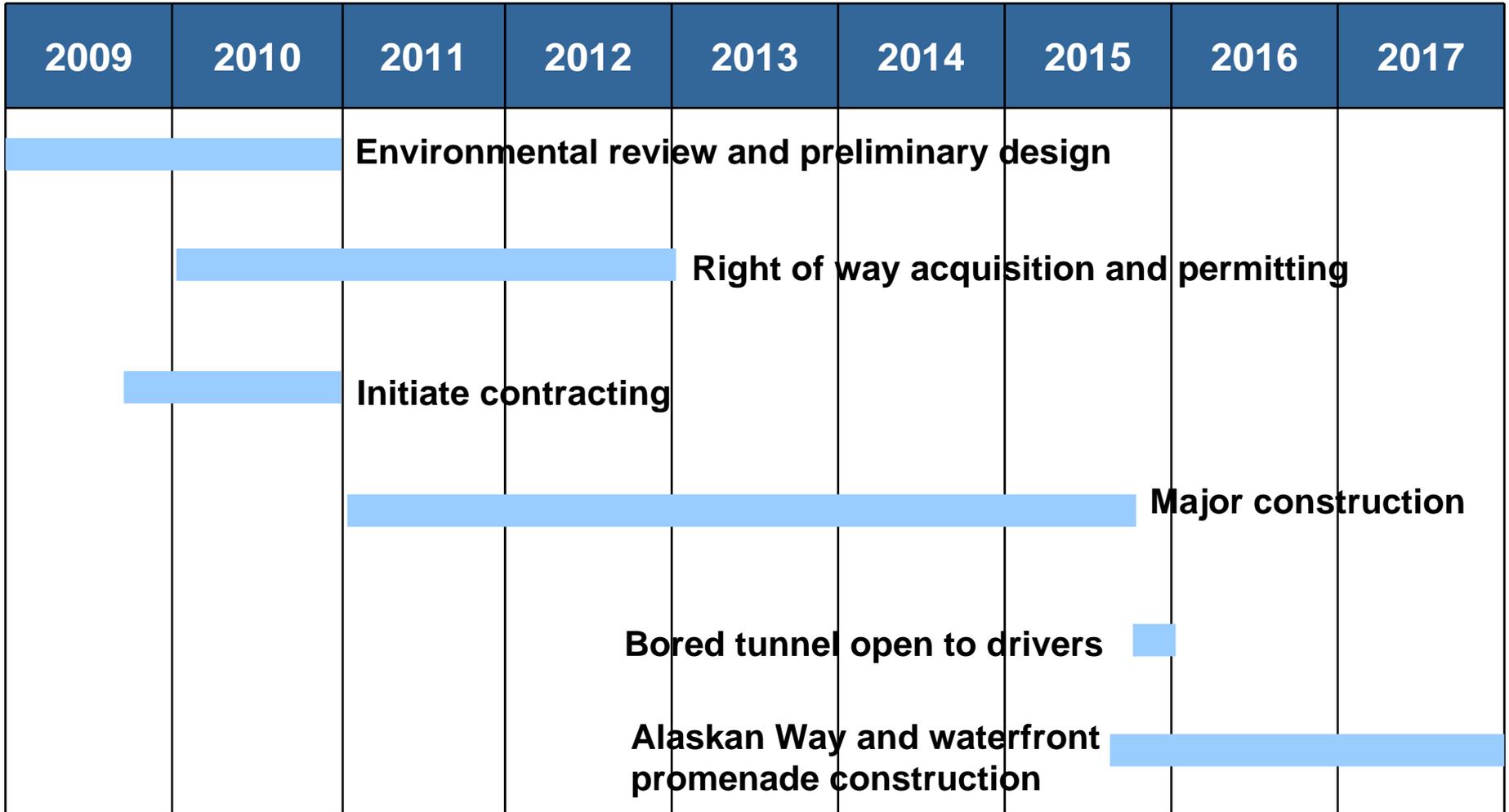
Transit enhancements will provide important mobility during and after construction and are critical to the success of the bored tunnel solution.

- Enhanced service to accommodate demand
  - Additional bus service
  - First Avenue streetcar
- Access to downtown
- Construction mitigation
- Environment





# Bored Tunnel Project Timeline





# How is the bored tunnel different from the cut-and-cover tunnel?

<b>Bored Tunnel Hybrid Alternative</b>	<b>Previous Cut-and-Cover Tunnel Alternative</b>
<ul style="list-style-type: none"><li>• Stacked with two lanes in each direction.</li><li>• Constructed under First Avenue.</li><li>• Top of tunnel is 30 to 200 feet below the surface.</li><li>• Viaduct can stay open to traffic while the tunnel is being built.</li><li>• Construction is estimated to take 4.5 years.</li><li>• Limits impacts to waterfront businesses.</li></ul>	<ul style="list-style-type: none"><li>• Stacked with three lanes in each direction.</li><li>• Constructed along the waterfront.</li><li>• Top of tunnel is 10 feet below the surface.</li><li>• Viaduct would have been closed for 3.5 years under the “short” construction plan.</li><li>• Construction was estimated to take 7 years under the “short” construction plan.</li><li>• Would cause major impacts to waterfront businesses.</li></ul>

# Alaskan Way Bored Tunnel vs. Boston's Big Dig

## More differences than similarities

### Boston's Big Dig Central Artery/Tunnel

Substantially larger and more complex including:

1. Very disruptive cut-and-cover tunnel through the central city under the existing elevated roadway and 2 subway lines.
  2. A signature cable-stayed bridge over the Charles River, cut-and-cover through South Boston.
  3. Two sets of immersed tubes under the harbor to the airport and the complex interchange with very poor geotechnical conditions.
- Project was disruptive and required extensive traffic management and mitigation.
  - The initial project cost number did not include added scope, mitigation and environmental requirements, inflation and appropriate allowance for risk and escalation.
  - The Central Artery/Tunnel did not have a strong agency management or consistent leadership throughout the course of the project.
  - As a result, the project was delivered grossly over budget and years behind schedule.

	Bored Tunnel & South End Project	Big Dig Projects
Total Project Length	2.8 miles	8 miles
Number of tunnels*	1	3
Length of tunnels*	2 miles	5 miles
Total lane miles	12.8 miles	>161 miles

\*Boston Big Dig tunnels included cut-and-cover, immersed tubes, jacked tunnel and other special tunneling methods.

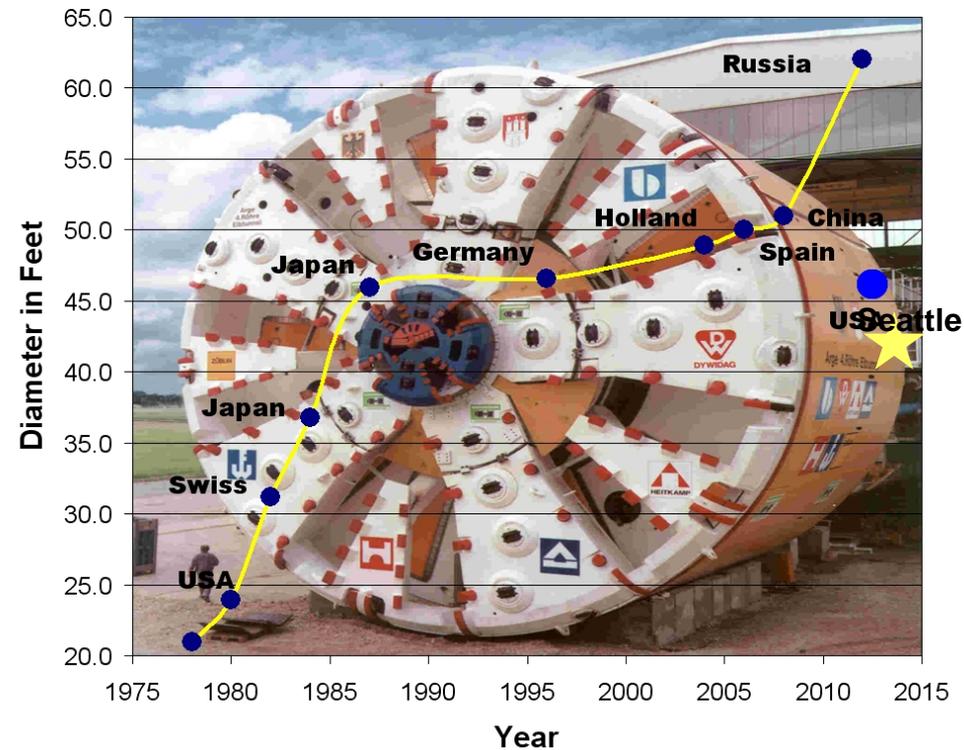
### SR 99 Bored Tunnel

- Project will run 30-200 feet underground minimizing traffic disruption and impacts to the waterfront and downtown
- WSDOT uses the CEVP® process on all state projects over \$100M to ensure costs are complete, reasonable, defensible and appropriately represent risk and uncertainties.
- WSDOT is a strong owner in policy, management and technical capability and Governor Gregoire is project authority
- WSDOT will maintain this strength over the life of the project, assisted by eminent private-sector engineers and contractors
  - Accountable to the public, Governor and Legislature

# Tunneling Technology

- Tunneling technology is rapidly advancing, with tunnel boring machines as large as 62 feet in diameter on order.
- Successful tunnel boring machine projects:
  - Sound Transit Beacon Hill: 21 feet in diameter
  - Hamburg and Moscow: 46.6 feet in diameter
  - Madrid: 50 feet in diameter
  - Shanghai: 50.6 feet in diameter

Increasing Size of Bored Tunnels



# Successful Delivery of Bored Tunnel Projects

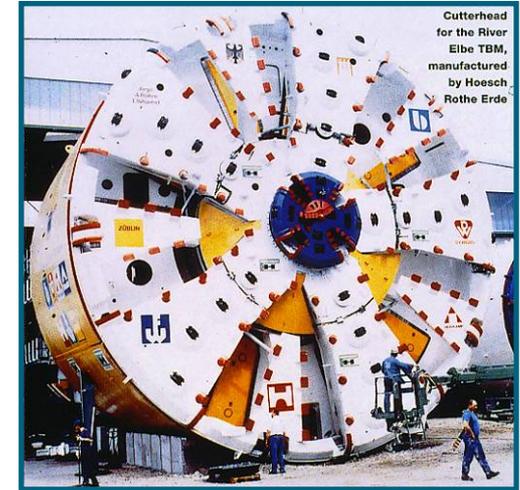
## Examples of Tunnel Excavation in Urban Areas

- 4th Elbe River, Hamburg: Successfully excavated 1.6 miles at 46.6-ft-diameter.
- Lefortovo Tunnel, Moscow: Rebuilt Elbe TBM successfully excavated 2 bores each 1.4 miles long at 46.6-ft-diameter. Same machine refurbished for another 2 tunnels in Moscow.
- Madrid M30 EPB: Successfully excavated 2 bores each 1.3 miles long at 50-ft-diameter by 2 closed-face TBMs built by different manufacturers. M30 diameter was about 10 ft larger than previous TBMs (~50% greater face area).
- Shanghai Yangtze River Mixshield: Successfully excavated 2 bores each 4.6 miles long at 50.6-ft-diameter. This TBM is the current record holder for diameter. Tunnel completed about a year ahead of original schedule.

## Pending Record Holder

- Moscow Road/Rail Tunnel: A 62-ft-diameter Mixshield has been ordered. This diameter is 11-ft larger than Shanghai TBM, the current record holder.

Elbe Tunnel Slurry Machine



Madrid Calle M30



Seven tunnel boring machines will be used in the Madrid Calle 30 project



# Tunneling in Seattle Soils

**Numerous tunnel machines, including several in Seattle, have successfully excavated ground conditions similar to those anticipated. Over 150 tunnels have been constructed in Seattle since 1890, mostly in glacial soils. Examples include:**

- **Sound Transit Beacon Hill:**
  - Glacial sand, silt, clay and till up to 160-ft depth.
  - Soils were similar to the hard/dense soils along most of proposed alignment.
  
- **Denny Way CSO:**
  - Glacial sand, silt, clay and till up to 160-ft depth.
  - Soils were similar to hard/dense soils along most of proposed alignment.

# Fiscal Responsibility

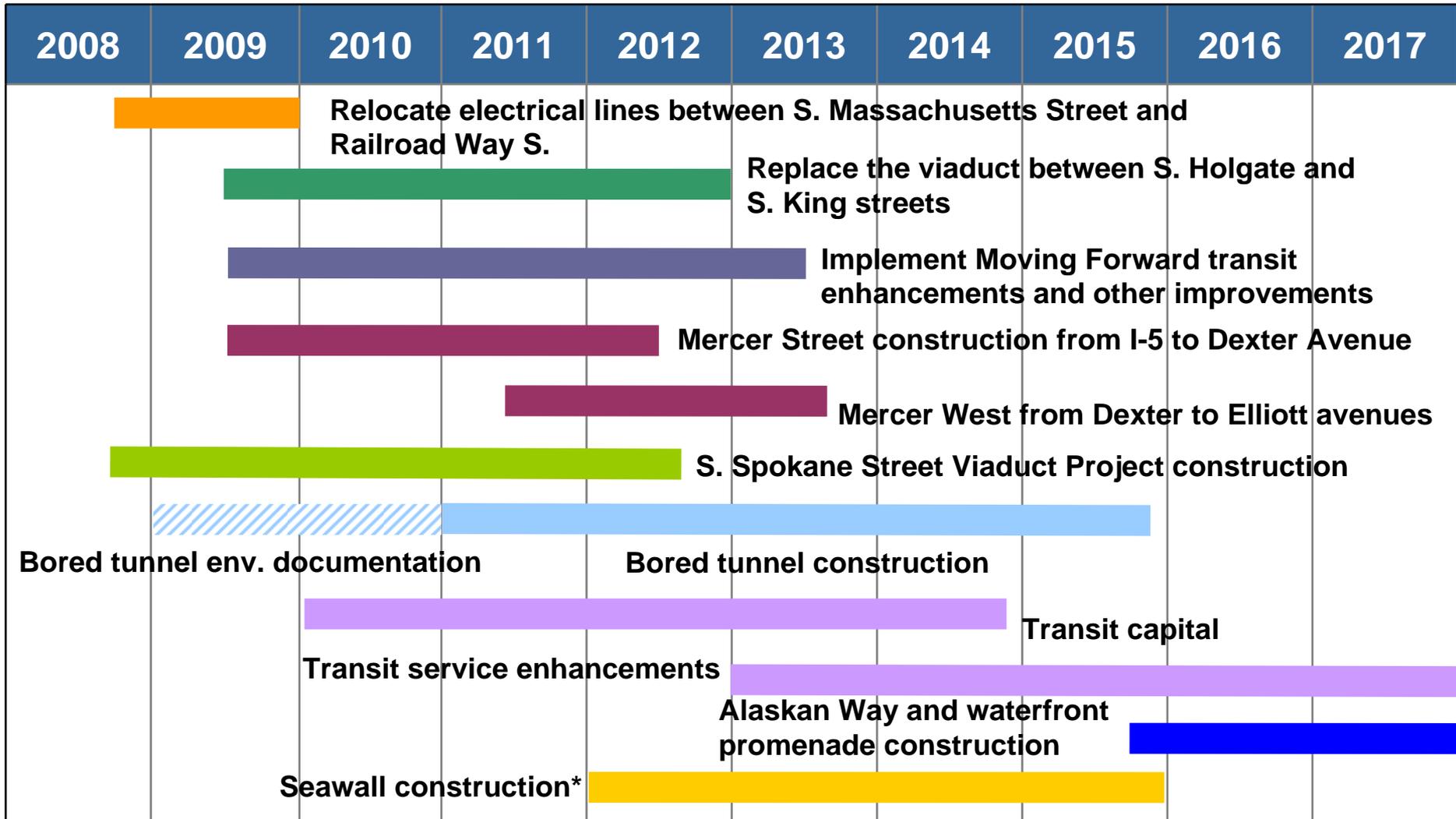
	Proposed Project Implementation Responsibility				Costs
	State	King County	City of Seattle	Port of Seattle ***	
Moving Forward and Prior Expenditures	\$600 million			\$300 million	\$900 million*
SR 99 Bored Tunnel	\$1.9 billion**				\$1.9 billion
Alaskan Way Surface Street and Promenade	\$290 million		\$100 million		\$390 million
Central Seawall			\$255 million		\$255 million
Utility Relocation			\$250 million		\$250 million
City Streets and Transit Pathways		\$25 million	\$190 million		\$215 million
Transit Infrastructure and Services		\$115 million	\$135 million		\$250 million
Construction Transit Service	\$30 million	\$50 million			\$80 million
<b>Total</b>	<b>\$2.82 billion</b>	<b>\$190 million</b>	<b>\$930 million</b>	<b>\$300 million</b>	<b>\$4.24 billion</b>
Transit Operations Annual Cost		\$15 million			\$15 million

\*Reflects cost savings from Moving Forward program realized by not repairing the viaduct from Lenora to Battery Street Tunnel and not completing the second phase of fire and life safety upgrades to the Battery Street Tunnel.

\*\*Reflects the most likely cost based on a conceptual design. The potential cost range is between \$1.2 billion and \$2.2 billion.

\*\*\*Agreement in concept for up to \$300 million subject to Port of Seattle Commission review and approval.

# Program Timeline



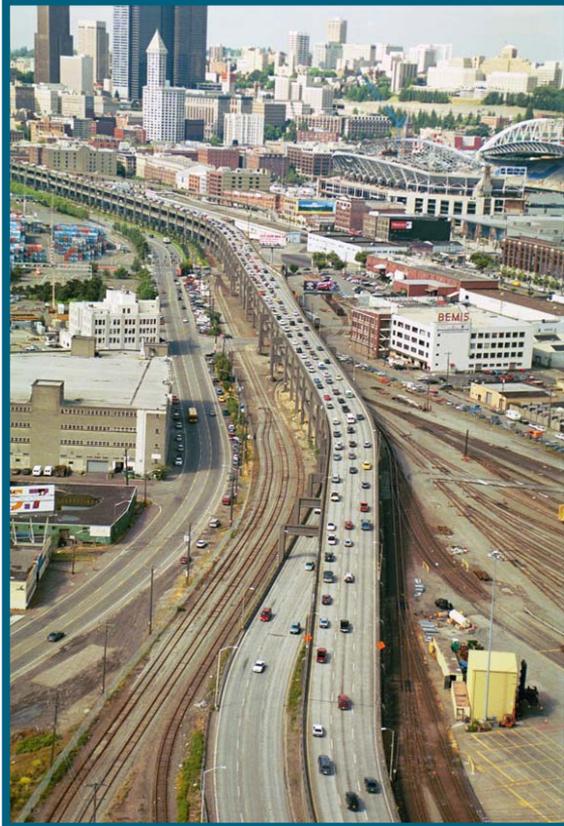
\*Seawall construction will take two years, but will be done seasonally based on environmental and other factors



# Next Steps

- Coordinate with freight community to ensure viable freight routes and connections.
- Get legislative approval for necessary funding.
- Work with the City, County and Port to coordinate project implementation.
- Complete environmental review process.
- Develop additional preliminary engineering and soils exploration.
- Meet with community groups and businesses to finalize design.

# Alaskan Way Viaduct and Seawall Replacement Program



Follow our progress: [www.alaskanwayviaduct.org](http://www.alaskanwayviaduct.org)

**Back Pocket**



# Decision-Making Process

**Along the way, three groups met regularly to review technical analysis and weigh-in on the options considered for replacing the central waterfront. Those groups were:**

- Stakeholder Advisory Committee
- Interagency Working Group
- Executive Oversight Committee

# Bored Tunnel Hybrid

- Improves public safety.
- Encourages job creation and health of the regional economy.
- Maintains movement of people and goods for trips to and through downtown.
- Improves pedestrian access.
- Improves transit frequency and reliability.
- Minimizes construction and traffic impacts.
- Improves key east/west city street connections.
- Reconnects downtown and Elliott Bay, creating a world-class waterfront.



# Support a Strong State and Regional Economy

## The bored tunnel alternative:

- Maintains capacity in the SR 99 corridor.
- Preserves I-5 for state and regional through trips.
- Provides room for freight and port traffic to grow.
- Minimal impacts to waterfront businesses and the local community.
- Maintains and creates 10,000 jobs each year over the course of the project.





# Improve Public Safety

## **The bored tunnel alternative keeps the public safe by:**

- Improving lane and shoulder widths.
- Installing modern fire protection safety equipment, including emergency exits.

## **Tunnels perform better in earthquakes than bridges.**

- Structural engineers agree that tunnels are one of the safest places to be during an earthquake because a tunnel moves with the earth.

# Enhance Seattle's Waterfront, Downtown and Adjacent Neighborhoods

## The bored tunnel alternative:

- Moves SR 99 underground and eliminates noise, shadowing and view blockage from the existing viaduct.
- Reconnects downtown with the natural environment in Elliott Bay.
- Creates a memorable place for people to live, work and play.



# Improve the Health of the Environment

## The bored tunnel alternative:

- Creates a new system to improve and handle storm water runoff.
- Creates new transit, bike and pedestrian connections.
- Adds one million hours of new transit service.





# SR 99 Bored Tunnel Cost

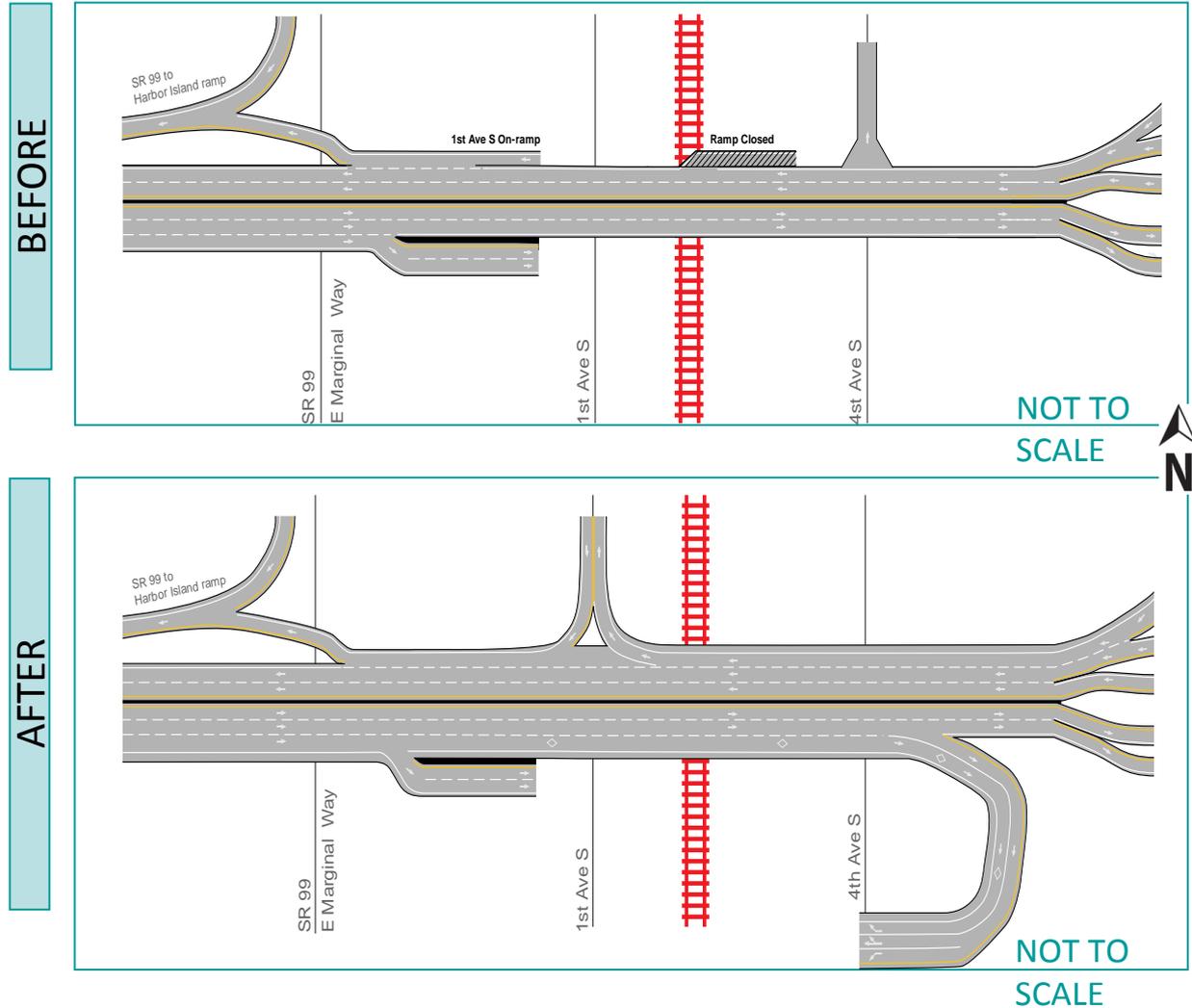
Risk-based estimating nationally recognized as a best practice for mega-projects

	Cost (Millions)
Construction Estimate (bored tunnel only)	\$944
Construction Management and Administration	\$118
Preliminary and Final Design	\$118
Contingency	\$150
Risk	\$268
Escalation (per Global Insight)	\$166
Right-of-Way Costs	\$149
<b>TOTAL</b>	<b>\$1,913</b>



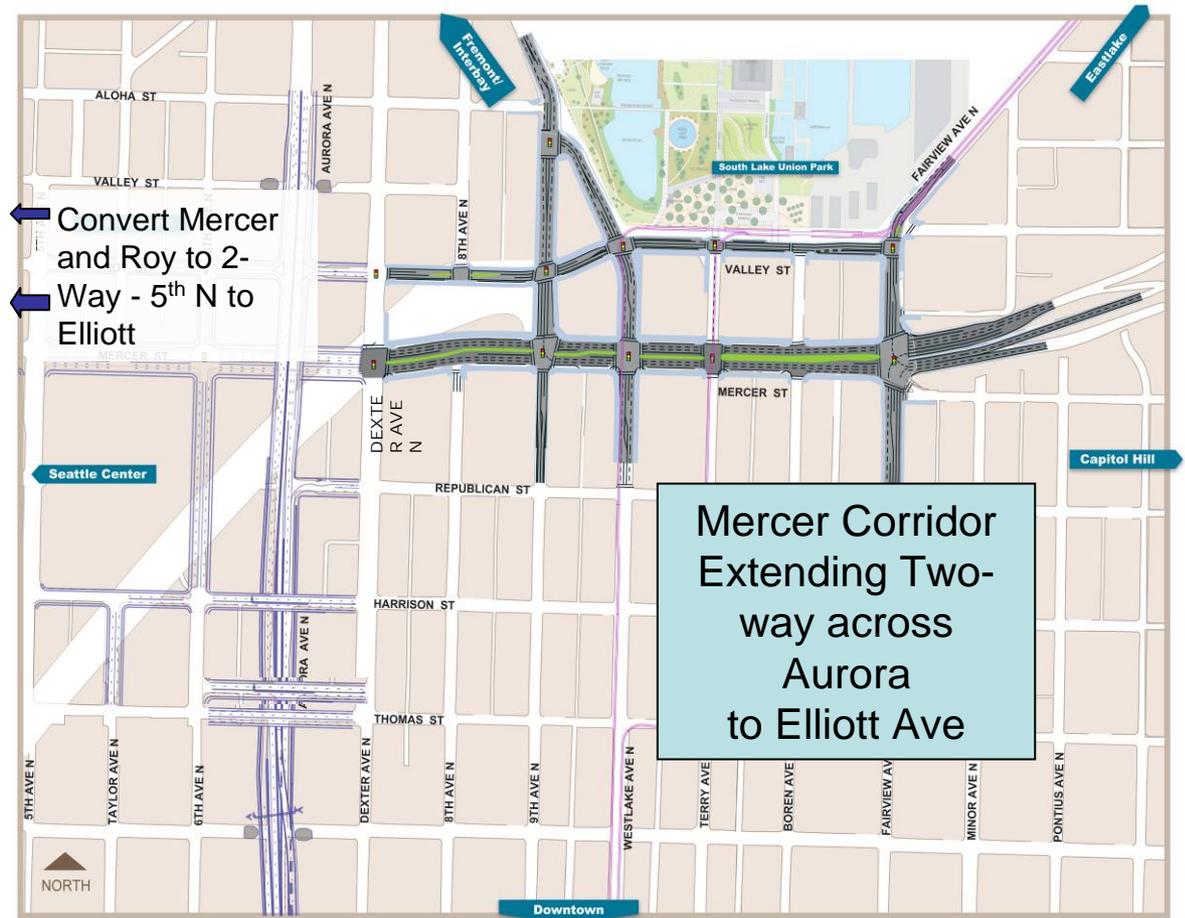
# Spokane Street Project

- Provides critical connections between the Port, West Seattle, I-5, I-90 and SR 99.
- Improves westbound traffic flow and safety.
- Minimizes conflicts between freight, rail, commuters and ferry traffic.

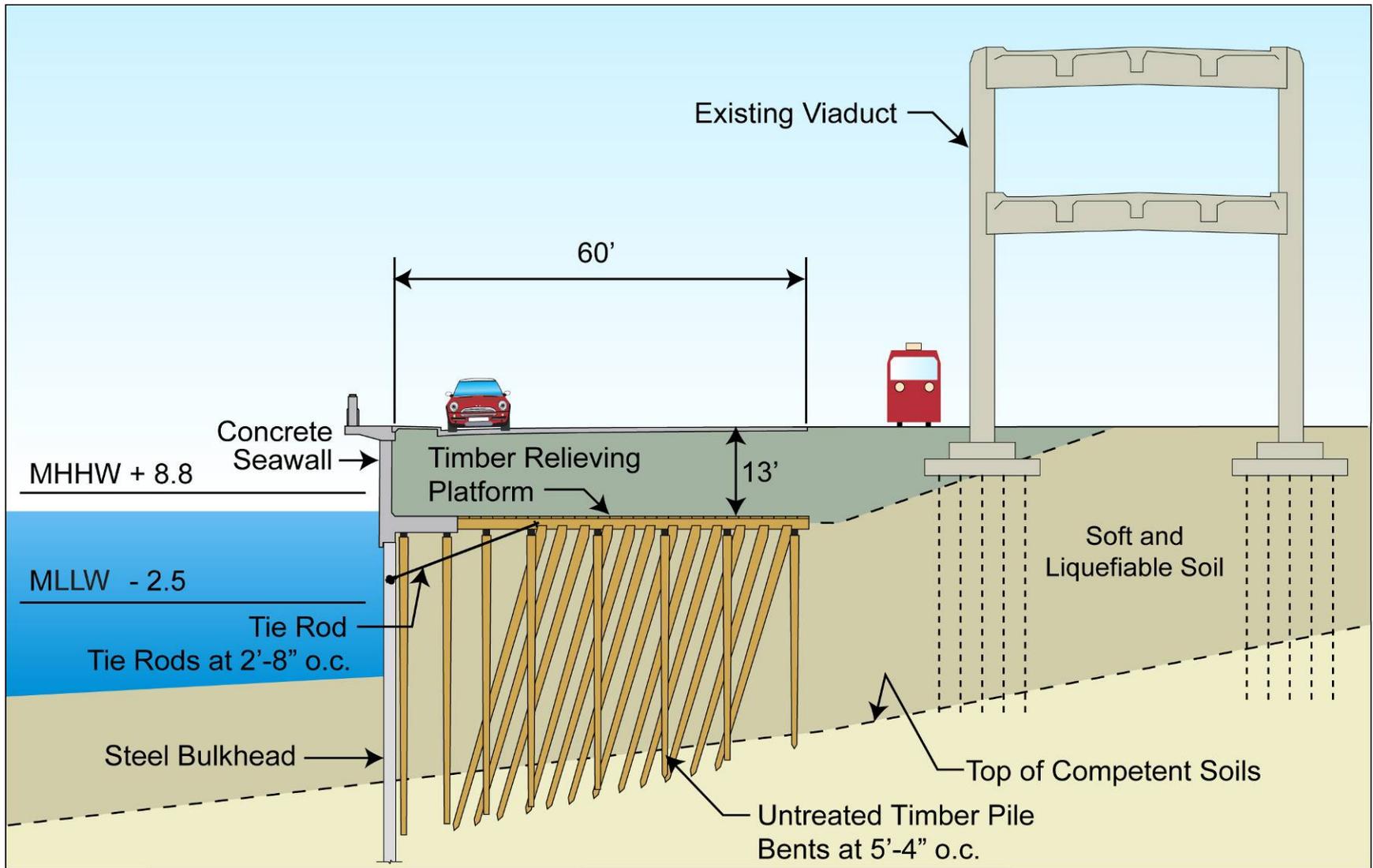


# Mercer Corridor Project

- Creates enhanced east-west connections.
- Improves connections from Ballard/Magnolia/Interbay to I-5 and the bored tunnel.
- Removes barriers, such as turn restrictions, and makes it easier to get around by car, truck, foot or bike.
- Enhanced connections between high density neighborhoods as well as the Seattle Center.

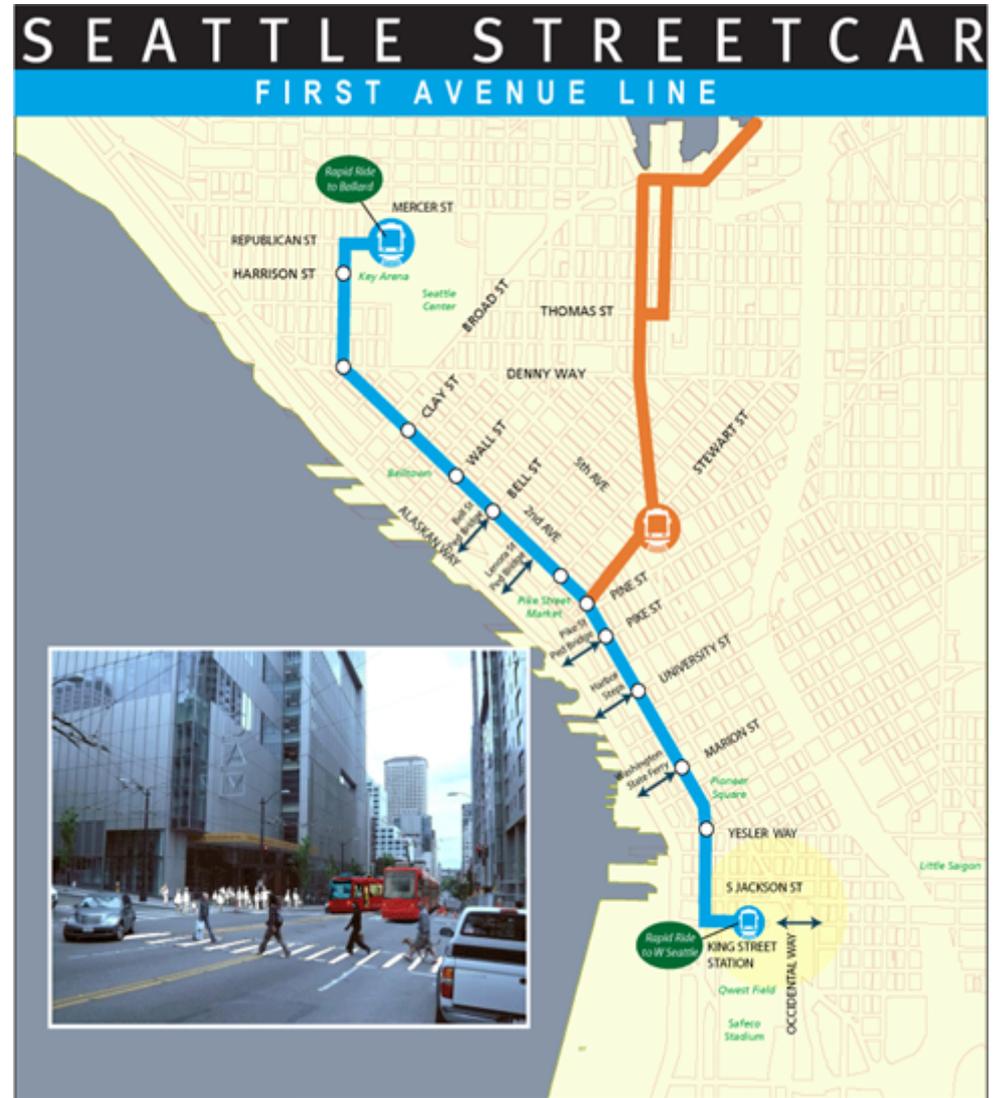


# Replacing the Seawall (Washington to Pine)



# First Avenue Streetcar

- Connects to the First Hill Streetcar.
- Connects to Ballard and West Seattle RapidRide lines.
- Connects to Amtrak, Commuter Rail and Light Rail at King Street Station.
- Provides easy access to Colman Dock.
- Connects major activity centers: Seattle Center, Pike Place Market and the stadium area.



# Metro's Funding Gap

## Metro Transit Sales Tax Revenue

As of 2/17/09

